OMSAO File Specifications README

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This document lists all swath dimensions, geolocation fields, and data fields present in the SAO OMI data product files of the OMBRO, OMHCHO, and OMOCLO PGEs. Metadata entries will be added in a future update. The contents of this file are essentially a reformatted version of the File Specification (*.fs files) documents for the various PGEs. More information on the OMBRO, OMHCHO, and OMOCLO PGEs is available at http://www.cfa.harvard.edu/~tkurosu/SatelliteInstruments/OMI/PGEReleases/

1. Swath Dimensions

Name	Data Type	Dimension	Min. Value	Max Value	Description	PGEs
nCharLenFitElements	I4	fixed	0	256	The length of strings describing the fitting elements. Varied elements only (see also *nFitElements* and *FittingParameterNames*)	all
nFitElements	I4	fixed	0	9999	Number of elements varied in the fitting process	all
nTimes	I4	fixed	0	9999	Number of swath lines in the granule	all
nUTCdim	I4	fixed	6	6	Number of elements in a single *TimeUTC* field entry	all
nWavCalPars	I4	fixed	0	9999	Number of wavelength calibration parameters in the fit	all
nXtrack	I4	fixed	0	60	Number of ground pixels per swath line	all

2. Geolocation Fields

Name	Data Type	Dimension	Min. Value	Max Value	Units	Description	PGEs
Latitude	R4	nXtrack,nTimes	-90.0	90.0	deg	The geodetic latitude (in deg) at the center of the ground pixel	all
Longitude	R4	nXtrack,nTimes	-180.0	180.0	deg	The geodetic longitude (in deg) at the center of the ground pixel	all
SolarZenithAngle	R4	nXtrack,nTimes	0.0	180.0	deg	The solar zenith angle (in deg) at the center of the ground pixel	all
SpacecraftAltitude	R4	nTimes	0.0e+00	1.0e+30	m	The altitude (in m) of the EOS-Aura satellite above WGS84 ellipsoid	all
TerrainHeight	I2	nXtrack,nTimes	-1000	10000	m	The terrain height (in m) at the center of the ground pixel	all
Time	R8	nTimes	0.0e+00	1.0e+10	s	The TAI93 time (in s) at the start of the "scan"	all
TimeUTC	I2	nUTCdim,nTimes	0	9999	n/a	UTC value of the TAI93 time at the start of the "scan". UTC time of format of the UTC string, YYYY-MM-DDThh:mm:ss.dddddddZ, is divided into 6 integer fields containing YYYY year (position 1) MM month (position 2) DD day (position 3) hh hours (position 4) mm minutes (positon 5) ss seconds (positon 6)	all
ViewingAzimuthAngle	R4	nXtrack,nTimes	-180.0	180.0	deg	The viewing azimuth angle (in deg) at the center of the ground pixel	all

3. Data Fields

Name	Data Type	Dimension	Min. Value	Max Value	Units	Description	PGEs
AirMassFactor	R8	nXtrack,nTimes	0.0e+00	9.9e+99	n/a	Molecule specific air mass factor for each ground pixel; in the case of HCHO including scattering weights, clouds, and vertical distribution of HCHO	OMBRO OMHCHO
AirMassFactorDiagnosticFlag	I2	nXtrack,nTimes	-2	13127	n/a	Diagnostic flag for molecule specific air mass factor for each ground pixel. The flag indicates surface conditions and out of bound viewing geometry. Except for geometry and surface type, flag is computed additively, *i.e.*, it is the sum of all the conditions that apply to a ground pixel. Note that many of the values below are applicable to OMHCHO only. Non-additive values = -2 Out of bounds viewing geometry, no AMF computation possible = -1 No table lookup possible; geometric AMF used instead = 0-100 NISE snow cover fraction = 101 NISE permanent ice = 103 NISE dry snow = 104 NISE ocean = 125 NISE suspect (no snow cover assumed) = 127 NISE error (no snow cover assumed) Additive values + 1000 No OMI cloud fraction; use ISCCP climatology + 2000 No OMI cloud top height; use ISCCP climatology +10000 Sun glint possibility; assume albedo for ice	OMBRO OMHCHO
AirMassFactorGeometric	R8	nXtrack,nTimes	1.0e+00	9.9e+99	n/a	Geometric air mass factor for the viewing geometry of each ground pixel	all
AirMassFactorO3	R8	nXtrack,nTimes	0.0e+00	9.9e+99	n/a	Molecule specific air mass factor for each ground pixel, based on the OMCLDRR O_3-optimized cloud data fields *CloudFractionforO3* and *CloudPressureforO3*	OMHCHO
AirMassFactorO3DiagnosticFlag	I2	nXtrack,nTimes	-2	13127	n/a	Diagnostic flag for molecule specific air mass factor AirMassFactorO3 for each ground pixel. See description of AirMassFactorDiagnosticFlag	OMHCHO
AverageColumnAmount	R8	1	-9.9e+99	9.9e+99	mol/cm^2	Slant (OMOCLO) or total (OMBRO, OMHCHO) column amount (in molecules/cm^2) averaged over the the whole granule, excluding “bad” data points (see *MainDataQualityFlag*)	all
AverageColumnUncertainty	R8	1	0.0e+00	9.9e+99	mol/cm^2	Slant (OMOCLO) or total (OMBRO, OMHCHO) column amount uncertainty (in molecules/ cm^2) averaged over the the whole granule, excluding “bad” data points (see	all

						MainDataQualityFlag)	
AverageFittingRMS	R8	1	0.0e+00	9.9e+99	n/a	Fitting RMS averaged over the the whole granule excluding “bad” data points (see *MainDataQualityFlag*)	all
ColumnAmount	R8	nXtrack,nTimes	-9.9e+99	9.9e+99	mol/cm^2	Slant (OMOCLO) or total (OMBRO, OMHCHO) column amount (in molecules/cm^2) for each ground pixel	all
ColumnAmountDestriped	R8	nXtrack,nTimes	-9.9e+99	9.9e+99	mol/cm^2	Slant (OMOCLO) or total (OMBRO, OMHCHO) amount uncertainty (in molecules/cm^2) for each ground pixel	
ColumnUncertainty	R8	nXtrack,nTimes	0.0e+00	9.9e+99	mol/cm^2	Slant (OMOCLO) or total (OMBRO, OMHCHO) column amount (in molecules/cm^2) for each ground pixel after application of a destriping correction. This correction is computed as *CrossTrackStripeFit* CrossTrackStripeCorrection*, which is subtracted from *ColumnAmount* to derive *ColumnAmountDestriped*	all
CrossTrackStripeCorrection	R8	nXtrack,nTimes	-9.9e+99	9.9e+99	mol/cm^2	This correction is multiplied by *CrossTrackStripeFit* and subtracted from *ColumnAmounts* to derive *ColumAmountsDestriped*	all
CrossTrackStripeFit	R8	nTimes	-9.9e+99	9.9e+99	mol/cm^2	Amount of *CrossTrackStripeCorrection* in *ColumAmount* that has been removed to derive *ColumnAmountDestriped*	all
EffectiveSolarZenithAngle	R8	nXtrack,nTimes	0.0	180.0	deg	Effective solar zenith angle (in deg), constructed such that its Cosine equals the sum of Cosines of the solar zenith angle and the viewing zenith angle	all
FitConvergenceFlag	I2	nXtrack,nTimes	-12	12344	n/a	The flag indicating the type of (non-) convergence of the non-linear least squares fitting routine associated with the ground pixel. Exit integer scalar that indicates why the return is taken: =10000 convergence due to criterion no. 1 below = 2000 convergence due to criterion no. 2 below = 300 convergence due to criterion no. 3 below = 40 convergence due to criterion no. 4 below = x where x equals 0,1,2,3 or 4 < 0 indicates that no convergence criterion is fulfilled but some abnormal termination criterion is satisfied = -1 if m<n or n<=0 or m<=0 or mdc<m or mdw<n*n+5*n+3*m+6 or maxit<=0 or epsrel<0 or epsabs<0 or epsx<0 or invalid starting point on entry = -2 termination due to criterion no. 5 = -3 termination due to criterion no. 6 = -4 termination due to criterion no. 7 = -5 termination due to criterion no. 8 = -6 termination due to criterion no. 9 = -7 there is only one feasible point, namely x(i)=bl(i)=bu(i) ; i=1,2,...,n = -11 termination due to user stop indicator: fitting parameters out of bounds = -12 termination due to user stop indicator:	all

						"infinite loop" termination The convergence criteria are: 1) relative predicted reduction in the objective function is less than epsrel**2 2) the sum of squares is less than epsabs**2 3) the relative change in x is less than epsx 4) we are computing at noise level the last digit in the convergence code (see below) indicates how the last steps were computed = 0 no trouble (gauss-newton the last 3 steps) = 1 prank<n at the termination point = 2 the method of newton was used (at least) in the last step = 3 the 2nd but last step was subspace minimization but the last two were gauss-newton steps = 4 the steplength was not unit in both the last two steps The abnormal termination criteria are: 5) no. of iterations has exceeded maximum allowed iterations 6) the hessian emanating from 2nd order method is not pos def 7) the algorithm would like to use 2nd derivatives but is not allowed to do that 8) an undamped step with newtons method is a failure 9) the latest search direction computed using subspace minimization was not a descent direction (probably caused by wrongly computed jacobian) The convergence constants and dimension parameters are: maxit maximum number of allowed iterations tol pseudo rank tolerance constant epsrel relative convergence constant epsabs absolute convergence constant epsx parameter convergence constant n integer scalar containing the number of unknowns mdc integer scalar (mdc must be >= m) m integer scalar containing the number of data points	
FittingParameterColumns	R8	nFitElements, nXtrack,nTimes	-9.9e+99	9.9e+99	n/a	Columns values of all fitting parameters varied in the fit. Check *FittingParameterNames* for the list of parameters	all
FittingParameterCorrelations	R8	nFitElements,	-9.9e+99	9.9e+99	n/a	Off-diagonal elements of the covariance matrix for the	all

		nXtrack,nTimes				main fitting parameter, specifying correlations between the fitting elements varied during the retrieval process and the main target. Check *FittingParameterNames* for the list of parameters	
FittingParameterNames	CHAR	nCharLenFitElements	0	32767	n/a	Names of the elements included in the *FittingParameterColumns*, *FittingParameterCorrealtions*, and *FittingParameterUncertainty* arrays, separated by commas (',')	all
FittingParameterUncertainty	R8	nFitElements, nXtrack,nTimes	0.0e+00	9.9e+99	n/a	Uncertainties of the columns values of all fitting parameters given in *FittingParameterColumns*. Check *FittingParameterNames* for the list of parameters	all
IterationCount	I2	nXtrack,nTimes	0	32767	n/a	Number of calls to the ELSUNC fitting routine until convergence of fit. Must be checked against value of *FitConvergenceFlag* to assure that the number of iterations did not exceed the maximum number of allowed iterations	all
MainDataQualityFlag	I2	nXtrack,nTimes	-1	2	n/a	Main flag to indicate data quality. Its main purpose is to give the user of the data an easy way to screen for suspect or bad pixels. The possible values are -1=Missing, 0=Good, 1=Suspect, 2=Bad. They are determined as follows. = -1 No column values have been computed; entries are missing. = 0 Column values are present and pass all quality checks. Data may be used with confidence = 1 Suspect columns. Data should be used with caution because one or more of the following quality checks failed: (a) *FitConvergenceFlag* is < 300 (but >= 0) (b) Column value plus 1sigma fitting uncertainty is < 0.0 (c) AMF was reset to high value because of high cloud cover, creating a column of effectively 0.0 (OMHCHO only) = 2 Bad columns. Data should not be used at all, or only with extreme caution, because one or more of the following quality checks failed: (a) *FitConvergenceFlag* is < 0 (abnormal termination of fitting) (b) Column value plus 2sigma fitting uncertainty is < 0.0	all
PixelCornerLatitudes	R4	nXtrack+1, nTimes+1	-90.0	90.0	deg	The geodetic latitudes (in deg) of the corner coordinates of the OMI ground pixels	all
PixelCornerLongitudes	R4	nXtrack+1, nTimes+1	-180.0	180.0	deg	The geodetic longitudes (in deg) of the corner coordinates of the OMI ground pixels	all
RadianceReferenceColumnAmount	R8	nXtrack	-9.9e+99	9.9e+99	mol/cm^2	Slant (OMOCLO) or total (OMBRO, OMHCHO) column	all

						amount (in molecules/cm*2)* for each ground pixel in the reference swath line	
RadianceReferenceColumnUncertainty	R8	nXtrack	0.0e+00	9.9e+99	mol/cm^2	Slant (OMOCLO) or total (OMBRO, OMHCHO) column amount uncertainty (in molecules/cm*2)* for each ground pixel in the reference swath line	all
RadianceReferenceConvergenceFlag	I4	nXtrack	-10	12344	n/a	The flag indicating the type of (non-) convergence of the non-linear least squares fitting routine for the radiance reference fit. For a detailed description of the flag refer to *FitConvergenceFlag*	all
RadianceReferenceFit	R8	nWavCalPars, nXtrack	-9.9e+99	9.9e+99	n/a	Non-gas fitting parameters for radiance reference fit. See *SolarWavcalFit* for list of individual parameters	all
RadianceReferenceFittingRMS	R8	nXtrack	0.0e+00	9.9e+99	n/a	Fitting RMS for each ground pixel in the radiance reference line	all
RadianceReferenceIterationCount	I2	nXtrack	0	32767	n/a	Number of iterations until convergence for the radiance reference fit	all
RadianceReferenceScanLineNumber	I2	1	-1	32767	n/a	Scan line number for radiance reference fit performed before the processing of the whole granule. Usually around the equator, and usually equal to the scan line number of the radiance wavelength calibration. Used mainly to pre-determine bad CCD pixels to be excluded from the radiance fitting window	all
RadianceWavCalConvergenceFlag	I2	nXtrack	-10	12344	n/a	The flag indicating the type of (non-) convergence of the non-linear least squares fitting routine for the radiance wavelength calibration. For a detailed description of the flag refer to *FitConvergenceFlag*	all
RadianceWavCalFit	R8	nWavCalPars, nXtrack	-9.9e+99	9.9e+99	n/a	Non-gas fitting parameters for radiance wavelength calibration. See *SolarWavcalFit* for list of individual parameters	all
RadianceWavCalIterationCount	I2	nXtrack	0	32767	n/a	Number of iterations until convergence for the radiance wavelength calibration	all
RadianceWavCalScanLineNumber	I2	1	-1	32767	n/a	Scan line number used for radiance wavelength calibration	all
SolarWavCalConvergenceFlag	I2	nXtrack	-10	12344	n/a	The flag indicating the type of (non-) convergence of the non-linear least squares fitting routine for the solar wavelength calibration. For a detailed description of the flag refer to *FitConvergenceFlag*	all
SolarWavCalFit	R8	nWavCalPars, nXtrack	-9.9e+99	9.9e+99	n/a	Fitting parameters for wavelength calibration ("non-gases"). The individual parameters are Baseline 0th Order, Baseline 1st Order, Baseline 2nd Order, Baseline 3rd Order, Scaling 0th Order, Scaling 1st Order, Scaling 2nd Order, Scaling 3rd Order, Solar Intensity, Slit Width at 1/e (in nm), Slit Asymmetry, Wavelength Shift (in nm), Wavelength Squeeze	all
SolarWavCalIterationCount	I2	nXtrack	0	32767	n/a	Number of iterations until convergence for the solar wavelength calibration	all